

**COMPACT WALL PHONE**

**FILTER HOUSING UNIT**

**BACKGROUND OF THE INVENTION**

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This invention relates generally to impedance blocking filter circuits used in telecommunication systems. More particularly, it relates to a compact wall phone filter housing unit of a unique construction which is adapted for interfacing between incoming telephone lines connected to a wall telephone mounting plate and subscriber's or customer's network termination equipment.

15 In view of telephone technology of today, there are many telephone subscribers or customers that have a personal computer with a modem located on their premises. At times, the computer user desires to receive DSL (an acronym for Digital Subscriber Line) signals from the Internet over the same telephone lines via the modem which is connected to an Internet Service Provider (ISP). In order to increase the speed of downloading of information from the Internet, a DSL network interface is typically purchased and installed between the incoming telephone lines and the user's computer. However, since one or more telephone subscriber's network termination equipment such as telephone sets (including cordless

types), answering machines, facsimile (FAX) machines, 56 kb/s and lower rate modems, automatic dialers, and recorder connectors are also connected to the same incoming telephone lines via internal house wiring, DSL  
5 interference problems may be caused by the network termination equipment which can significantly decrease data rates and/or can create attenuation loss, radiate noise and generate cross-talk.

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Accordingly, it has now been necessary to install some type of impedance blocking filter circuit on all of the subscriber's network termination equipment including wall phones so as to eliminate any erratic changes in the  
15 input impedances thereof. Unfortunately, the phone jacks for the wall phones are usually located in small, tight spaces such as in kitchens, hallways, garages and the like where it is inconvenient to place a table top phone. Generally, a wall telephone mounting plate is used for  
20 mounting the wall phone and includes a central communication jack with a pair of vertically spaced-apart mounting posts. In order to install the wall phone, a plug in the back of the phone is initially aligned with the central jack in the mounting plate and is then pushed  
25 into the jack so as to make a connection. At the same time, the pair of mounting posts are received in holes in

the back of the wall phone, and the phone is thereafter pulled downwardly so as to securely hold the same in place.

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There are known in the prior art of filter adapters which have been designed so as to interface between the wall telephone mounting plate and the subscriber's equipment. However, they have all suffered from one or more disadvantages such as being large, bulky, expensive and/or difficulties in installation. Further, other prior art designs have the drawbacks of being unable to fit in applications where the wall phone jacks are too close to a counter or cabinet and/or being too costly for manufacturing due to all of the wiring required for the filter components.

In view of the foregoing problems encountered, there still exists a need for a wall phone filter housing unit which is of a compact construction, is relatively easy to install, and is economical to manufacture and assemble. The housing unit of the present invention is of a unique configuration which is comprised of a base member, a cover member adapted for co-mating with the base member, and a PCB assembly having an impedance blocking filter

circuit mounted thereon disposed between the base member and the cover member.

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**SUMMARY OF THE INVENTION**

According, it is a general object of the present invention to provide a compact wall phone filter housing unit of a unique construction which is relatively simple and economical to manufacture and assemble.

It is an object of the present invention to provide a compact wall phone filter housing unit which is adapted for interfacing between incoming telephone lines connected to a wall telephone mounting plate and subscriber's or customer's network termination equipment.

It is another object of the present invention to provide a wall phone filter housing unit which is comprised of housing means for receiving a PCB assembly having an impedance blocking filter circuit mounted thereon, a first filtered modular jack connectable to a telephone set, a second filtered modular jack connectable to an answering machine or fax machine, and a third un-

filtered modular jack connectable to DSL or HPN equipment devices.

5        It is still another object of the present invention to provide a wall phone filter housing unit which includes slidable mounting means for facilitating easy and quick connection to a wall telephone mounting plate.

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         In accordance with a preferred embodiment of the present invention, there is provided a wall phone filter housing unit adapted for interfacing between incoming telephone lines connected to a wall telephone mounting  
15 plate and subscriber's network termination equipment. The housing unit includes a base member, a cover member adapted for co-mating with the base member, and a PCB assembly being disposed between the base member and the cover member. An impedance blocking filter circuit is  
20 mounted on the PCB assembly disposed between the base member and the cover member.

         The housing unit further includes a first modular  
25 plug extending from a central portion of the base member for insertion into a modular jack connected to incoming

telephone lines. A first filtered modular jack is mounted in a central portion of the cover member for receiving a second modular plug connected to a telephone set. A second filtered modular jack is formed upon one  
5 side of the PCB assembly for receiving a third modular plug connected to an answering machine or fax machine. A third unfiltered modular jack is formed upon another side of the PCB assembly for receiving a fourth modular plug connected to DSL or HPN equipment devices.

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**BRIEF DESCRIPTION OF THE DRAWINGS**

These and other objects and advantages of the  
15 present invention will become more fully apparent from the following detailed description when read in conjunction with the accompanying drawings with like reference numerals indicating corresponding parts throughout, wherein:

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Figure 1 is an exploded, perspective view of a component wall phone filter housing unit of the present invention which is adapted for interfacing between a wall telephone mounting plate and a wall phone;

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Figure 2 is a front, perspective view of the housing unit of Figure 1;

Figure 3 is a rear, perspective view of the housing unit of Figure 1;

Figure 4 is an exploded, perspective view of the housing unit of Figure 2;

Figure 5 is a front plan view of the front housing member of Figure 4;

Figure 6 is a rear plan view of the front housing member of Figure 4;

Figure 7 is a side elevational view of the front housing member, taken along the lines 7-7 of Figure 5;

Figure 8 is a cross-sectional view, taken along the lines 8-8 of Figure 6;

Figure 9 is a cross-sectional view, taken along the lines 9-9 of Figure 6;

Figure 10 is a front plan view of the rear housing member of Figure 4;

Figure 11 is a rear plan view of the rear housing member of Figure 4;

Figure 12 is a side elevational view taken along the  
5 lines 12-12 of Figure 10;

Figure 13 is a top plan view of the rear housing member, taken along the lines 13-13 of Figure 10;

10 Figure 14 is a cross-sectional view taken along the lines 14-14 of Figure 11;

Figure 15 is a cross-sectional view taken along the lines 15-15 of Figure 11;

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Figure 16 is a front plan view of the PCB assembly of Figure 4;

Figure 17 is a schematic circuit diagram of the  
20 impedance blocking filter circuit mounted on the PCB assembly of Figure 16;

Figure 18 shows the wire connector assembly having its wire pin being bent upwardly, prior to the wave  
25 soldering process; and



Figure 19 shows the wire connector assembly of Figure 18, after the wave soldering process.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

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Referring now to the various views of the drawings, there is shown in Figures 1 through 4 a compact wall phone filter housing unit **100**, constructed in accordance with the principles of the present invention, which is adapted for interfacing between a wall telephone mounting plate **200** and a conventional wall telephone **300**. The filter housing unit **100** houses an impedance blocking filter circuit which serves to isolate all voice band equipment devices such as telephone sets (including cordless types), answering machines, facsimile (Fax) machines, 56 kb/s and lower rate modems, automatic dialers, and recorder connectors located at a subscriber's or customer's premises from the high-speed DSL (Digital Subscriber Line) and HPN (Home Phone Network) signals (data streams).

The wall telephone mounting plate **200** is adapted to be secured directly to a supporting wall **210** by typically screws **212**. The mounting plate **200** includes a modular RJ-11 jack **214** located in its central portion and pro-

vided with a plug-receiving aperture **216**. A pair of mounting posts **218** are disposed vertically in a spaced-apart relationship on opposite sides of the RJ-11 jack **214**. Each of the mounting posts **218** includes a post shank **220** formed between a collar **222** and a head **224** which serves as a support for the wall phone housing unit **100**.

10 The wall housing unit **100** is adapted to be mounted to the wall mounting plate **200** and abuts against the front surface thereof. The wall unit **100** includes a RJ-11 plug **226** (Figure 3) which is received within the aperture **216** of the wall mounting plate. In addition, 15 the wall unit **100** is adapted to cooperate with the mounting post **218** and engages with the shank **220** of each mounting post **218** so as to secure the wall unit **100** in an upright position.

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Further, the wall unit **100** includes a filtered RJ-11 jack **228** (Figure 2) located in its central portion and provided with a plug-receiving aperture **230**. A pair of mounting posts **232** is located in a vertically spaced-apart relationship to each other on opposite sides of the 25 RJ-11 jack **228**. Each of the mounting posts **232** includes

a threaded end **234** and a head **236**. A collar **238** is disposed between the threaded end **234** and the head **236** so as to define a shoulder which is tightened down and abuts the top surface on the front housing member of the wall unit **100**. A post shank **240** is disposed between the collar **238** and the head **236** and functions as a support for the conventional wall telephone **300**.

The head **236** has a screwdriver slot **241** which is used to screw the threaded end **234** of the mounting post **232** into openings **242** formed in the front housing member of the wall unit **100**. A RJ-11 plug (not shown) on the back side of the wall phone **300** is moveable sufficiently so as to allow keyhole slots (also not shown) to slide over and contactly engage with the respective shanks **240** of the mounting post **232** when it is inserted into the jack **228**. The wall phone is thereafter pulled downwardly so as to securely hold the same in place.

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As can be seen from Figure 2, the wall unit **100** further includes a second filtered RJ-11 modular jack **244** positioned on the right side thereof which is used for connection to an answering or facsimile (Fax) machine. The wall unit **100** houses the impedance blocking

filter circuit which is used to filter both the wall  
phone connectable to the jack **228** and the answering or  
Fax machine connected to the jack **244**. In Figure 3, it  
will be noted that the wall unit **100** also includes a  
5 third unfiltered RJ-11 modular jack **246** positioned on the  
left side of Figure 2 which is used for the DSL or HPN  
equipment devices. The third jack **246** is unfiltered on  
the line connected to the DSL or HPN connection.

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As can best be seen from Figure 4, the wall filter  
housing unit **100** is comprised of a front or cover housing  
member **402**, a rear or base housing member **404**, and a PCB  
assembly **406** disposed between the cover member and the  
15 base member. An upper mounting latch **408** and a lower  
mounting latch **410** are insertable into the front housing  
member **402**. The PCB assembly **406** is used for mounting  
the electrical components of the impedance blocking  
filter circuit as well as modular plugs and jacks.

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The cover member **402** shown generally in Figure 4 and  
illustrated in more detail in Figures 5-9 will now be  
described. In particular, Figure 5 shows a front plan  
25 view of the cover member **402** of Figure 4, and Figure 6 is  
a rear plan view of the cover member **402** of Figure 4.

The front housing member **402** has an aperture **412** formed in a central location through which the RJ-11 wall phone jack **228** extends integrally from the top surface **414** thereof. The jack **228** has the footprint of a conventional RJ-11 communication jack which includes a plug-receiving aperture **416** and spring type conductor contacts **418**. There are disposed vertically on opposite sides of the jack **228** and adjacent to the respective top and bottom edges of the cover member **402** the opening **242** for receiving the threaded ends **234** of the mounting post **232** so that the collar **238** lies substantially flush with the top surface **414**. Further, the cover openings **242** are defined in small cylindrical members **420a**, **420b** which extend from the rear surface **422** of the cover member **402**. The threaded ends **234** of the mounting post **232** are threaded into the respective openings **242** in the cylindrical members **420a**, **420b**.

The cover member **402** is molded from a suitable plastic material, such as ABS plastic and the like and is comprised of a top wall member **424**, a bottom wall member **426**, and confronting sidewall members **428**, **430**. All of the wall members are formed integrally with the rear surface **422** so as to define a cavity **432** for receiving and enclosing the PCB assembly **406**. Below the

cylindrical member **420a**, there is provided a rectangularly-shaped opening **434** for receiving the upper mounting latch **408**. Similarly, above the cylindrical member **420b** there is provided a rectangularly-shaped opening **436** for  
5 receiving the lower mounting latch **410**.

The cylindrical member **420a** and the opening **434** are surrounded by a latch-receiving chamber **440** which is  
10 defined by opposed vertical wall members **442, 444** and a horizontal wall member **446** all integrally connected together. The vertical wall members **442, 444** are joined integrally to portions of the top wall member **424**. Each of the wall members is formed with a pair of parallel,  
15 spaced apart rib members **448** which are receivable in recesses formed in the base member **404**. The cylindrical member **420b** and the opening **436** are surrounded by a latch-receiving chamber **450** which is defined by opposed vertical wall members **452, 454** and a horizontal member  
20 **456** all integrally connected together. Each of the wall members **452, 454** is joined integrally to portions of the bottom wall member **426**. Each of the vertical wall members is formed with a pair of rib members **458** which are receivable in recesses formed in the base member **404**.

Each of the sidewall members **428, 430** is formed in its middle portion with a U-shaped slot **460** for receiving the respective jacks **244, 246** (Figures 2 and 3). Further, the rear wall surface **422** of the cover member is provided with a plurality of retaining posts **462** disposed adjacent to the side edges thereof. The retaining posts **462** extend upwardly from the rear surface **422** and are adapted to mate with the retaining holes in the base member so as to secure and interlock the cover member **402** and the base member **404**.

The base member **402** shown generally in Figure 4 and depicted in full detail in Figures 10-14 will now be described. In particular, Figure 10 is a front plan view of the base member **404** of Figure 4, and Figure 11 is a rear plan view of the base member **404** of Figure 4. The rear housing member **404** has a central stepped portion **502** which is formed with an aperture **504** thereon. The aperture **504** is defined by two upstanding support members **506** and a depression **508** formed therebetween for engaging the modular plug **226** (Figure 3).

There are disposed vertically on opposite sides of the stepped portion **502** and adjacent to the respective

top and bottom edges of the base member, U-shaped cut-outs **512a**, **512b**. The U-shaped cut-out **512a** is circumscribed by vertical supporting ledges **514**, **516** and a horizontal supporting ledge **518** all integrally formed together. Each of the vertical ledges **514**, **516** is provided with a channel **520** for receiving the ribs **442** of the chamber **440**. Similarly, the U-shaped cut-out **512b** is circumscribed by vertical supporting ledges **522**, **524** and a horizontal ledge **526** all integrally formed together. Each of the vertical ledges **522**, **524** is provided with a channel **528** for receiving the ribs **458** of the chamber **450**.

Further, there is disposed horizontally on opposite sides of the stepped portion **502** and adjacent to respective side edges **530**, **532** of the base member **404**, C-shaped cavities **534**, **536** for receiving the respective modular jacks **246**, **244**. The internal wall surface **540** of the base member is provided with a plurality of tubular projections **538** having retaining holes **540** formed therein for co-mating with the retaining posts **462** of the cover member **402**. The cover member **402** is also molded from a plastic material, such as ABS plastic and the like.



The PCB assembly **406** shown generally in Figure 4 and depicted in a plan view in Figure 16 will now be described. The PCB assembly **406** includes a printed circuit board **600** which is used to mount the electrical components of the impedance blocking filter circuit **700** depicted in the schematic circuit diagram of Figure 17. The various circuit parts of the blocking filter circuit **700** are inserted into eyelets **602** formed in the printed circuit boards **600** and are preferably wave soldered thereto so as to securely mount the same thereon. It should be understood that other impedance filter circuits may be alternatively mounted on the printed circuit board. Such alternate blocking filter circuits are illustrated and described in U.S. Patent No. 6,188,750 issued on February 13, 2001, assigned to the same assignee as the present invention, which is hereby incorporated by reference in its entirety.

In assembly, all of the electrical components of the impedance blocking filter circuit **700** and the modular plugs and jacks are mounted on the printed circuit board **600** so as to form the PCB assembly **406** shown in Figures 4 and 16. This is typically performed in a separate assembly operation. The shoulder screws **232** and the mounting latches **408, 410** are mounted to the top surface

of the cover member **402**, as illustrated in Figure 4. Next, the PCB assembly **406** is placed into the rear of the cover member **402** and is held therein by the retaining post **462**. Then, the base member **404** is placed over the  
5 cover member **402** so that the retaining post **462** formed on the interior surface of the cover member **402** are received in the aligned holes **540** disposed on the interior surface of the base member **404**, thereby sandwiching the PCB assembly **406** therebetween. The cover member and the base  
10 member are secured together by any conventional means of friction such as ultrasonic welding or the like so as to provide the wall phone filter housing unit **100** in its fully assembled condition, as depicted in Figures 2 and 3.

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With reference now to Figures 18 and 19, there is illustrated the assembly operation for mounting the connector wire assembly **604** having the spring-type  
20 conductor contacts or wire pins **418** onto the printed circuit board **600** so as to prevent solder from contacting the wire pins during a wave soldering process. In Figure 18, prior to the wave soldering there is shown a portion  
25 **417** of the wire pin **418** being bent upwardly into the connector wire assembly **604**, which is designed to be initially not fully installed in the printed circuit

board **600**. A cut-out piece **606** of the printed circuit board **600**, which was previously punched out, is re-installed temporarily into the center hole **608** so as to protect the wire pins from the solder to be applied.

5 Then, the wave soldering process is performed over the entire bottom side **610** of the printed circuit board **600** so as to securely mount all of the electrical components thereon.

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In Figure 19, after the wave soldering process, the connector wire assembly **604** is pushed down so as to fully seat against the top surface of the printed circuit board **600**. As a result, the cut-out piece **606** will also be  
15 pushed out by a plug portion **612** so that the portion **417** of the wire pin **418** comes to rest below the bottom side **610** of the printed circuit board **600**. The cut-out piece **606** is thereafter discarded.

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In use, the plug of the conventional wall phone **300** is initially disconnected from the wall telephone mounting plate **200**, and the wall phone filter housing **100** is connected instead to the mounting plate via the plug **226**  
25 extending to the base member **404**. Then, the wall phone **300** is connected to the housing unit **100** via the tele-

phone plug thereof. In order to facilitate installation of the housing unit to the mounting plate, the holes **434**, **436** formed in the cover member are used to provide visual alignment of the upper and lower mounting latches **408**, **410** with the mounting posts **218** formed on the mounting plate **200** (Figure 1). In this manner, the mounting posts **218** can be easily received in the keyholes as the telephone plug in the back of the wall phone **300** is inserted into the central jack **216** of the mounting plate **200**.

10 Next, the housing unit **100** is slid downwardly so as to cause the upward latch **408** to slide upwardly and the lower latch to slide downwardly, thereby causing engagement and locking with the respective mounting posts **232**. Finally, the plug on the wall phone is pushed into the

15 jack **228** so as to make a connection.

From the foregoing detailed description, it can thus be seen that the present invention provides a compact

20 wall phone filter housing unit which is adapted for interfacing between incoming telephone line connected to a wall telephone mounting plate and subscriber's or customer's network termination equipment. The wall phone filter housing unit includes a base member, a cover

25 member adapted for co-mating with the base member, and a PCB assembly having an impedance blocking filter circuit

mounted thereon disposed between the base member and the cover member. The wall phone filter housing includes upper and lower mounting latches so as to facilitate easy connection to a wall mounting plate.

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While there has been illustrated and described what is at present considered to be a preferred embodiment of the present invention, it will be understood by those skilled in the art that various changes and modifications may be made, and equivalents may be substituted for elements thereof without departing from the true scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the central scope thereof. Therefore, it is intended that this invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out the invention, but that the invention will include all embodiments falling within the scope of the appended claims.

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